ACADIA NATIONAL PARK ITS FIELD OPERATIONAL TEST

Acadia National Park Data Analysis

April, 2003

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16. Abstract

This report is one in a series that presents the results of data used to assess the impact of the Intelligent Transportation Systems (ITS) that were part of a field operational test at Acadia National Park on Mount Desert Island off the coast of Maine. ITS deployed at Acadia integrates various components that support the region's needs for transit management, traffic management, and traveler information. Operational data collected as part of normal operations by personnel of the National Park Service at Acadia were used to assess the impact of ITS on three goal areas: productivity and economic vitality, efficiency, and safety. Hypotheses were formulated in the three goal areas and tested with the data. The results indicate some but not all of the hypothesized impacts of ITS were realized. For the goal area of productivity and economic vitality, no direct impact on either gate receipts or donations was able to be tested due to incomplete deployment or inappropriate data. In the goal area of efficiency, the case can be made that the Park's road and parking resources were utilized more efficiently as a result of ITS on the basis of a greater proportion of visitors using the Island Explorer. In the area of safety, the sharp decline of 55% in vehicular accidents within the Park from 2001 to 2002 suggests that ITS may have played a part attracting people to the Island Explorer rather than use their own vehicles.

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Executive Summary

This document is one of series that reports the results of data collected to evaluate the effectiveness of the Field Operational Test of an Intelligent Transportation System fielded on Mount Desert Island, Maine. This ITS system was designed to relieve traffic congestion and enhance overall visitor experience in and around Acadia National Park.

This report addresses the operating data collected by personnel at Acadia National Park. These data are collected as a part of normal Park operations and include such measures as counts of visitors, gate receipts, donations, visitor center stops and accidents occurring on park roads. Data from 1999 to 2002 were collected and assessed by the evaluation team as part of the overall effort to measure the impact of ITS on Acadia National Park.

Early in the design phase of this FOT, stakeholder groups identified three principal goal areas that pertained to the operational data that the Park would provide: productivity and economic vitality, efficiency, and safety. Hypotheses in each of these areas were formulated and tested using the Park data.

ACADIA NATIONAL PARK ITS FIELD OPERATIONAL TEST

Acadia National Park Data Analysis

1.0 INTRODUCTION

This report is one of in a series that examines the impact of the ITS deployment. It presents the operating data collected by personnel at Acadia National Park from 1999 to 2002. The data collected were part of routine business and park management practice and have been traditionally collected by the National Park Service. These data were obtained from official park records by an analyst from Battelle as part of the evaluation of the Field Operational Test.

1.1 Overview of the Evaluation

The Intelligent Transportation Systems deployed at Acadia National Park integrate a variety of components that support the region's needs for transit management, traffic management, and traveler information. The components are interrelated and depicted in Figure 1-1. The relationship between the individual system components, the functional requirements, the system elements, and the needs addressed are shown in Table 1.1. Further elaboration can be found in the Acadia National Park ITS Field Operational Test: Strategic Plan.[1] Based on the collective feedback of the stakeholders, the overriding impact of the ITS technologies should be to reduce vehicle congestion in Acadia National Park. Reduced congestion will have the added benefits of increased mobility of visitors and residents, aesthetic and environmental benefits of fewer vehicles parked on roads, improved management of the transportation system, and safety benefits of less traffic and better emergency response.

The evaluation strategy was developed in cooperation with local partners and representatives from the state and federal Departments of Transportation. Despite the broad range of backgrounds and points of view of this group, their conclusions were very similar. There was considerable agreement among the project team that customer satisfaction and mobility were higher in priority than the other goals. However, other evaluation goal areas (safety, efficiency, productivity and economic vitality, and energy and environment) also held some level of importance among the stakeholder organizations.

The overall evaluation approach was based on several evaluation tests that combined primary and secondary data collection and analyses. Visitor on-site interviews, mail-back questionnaires to visitors and local areas businesses, personal interviews, direct observation, and system and historical data analysis were performed. The visitor and business surveys collected primary data on user awareness and satisfaction. Personal interviews with Island Explorer and Acadia National Park staff and other key stakeholders provided in-depth perspectives on issues affecting deployment and use of the technology. The systems data from the ITS components were used to document the type, content, and sources of information made available through the various input systems and characterize the use of various user interfaces by stakeholders. The data from Acadia National Park are the subject of this report, and findings of the other tests are reported in other documents in this series of individual test results.

[1] Acadia National Park ITS Field Operational Test Evaluation Strategic Plan, July 2000. Available at the ITS JPO evaluation Website: http://www.its.dot.gov/eval/docs_stateregionl.htm.

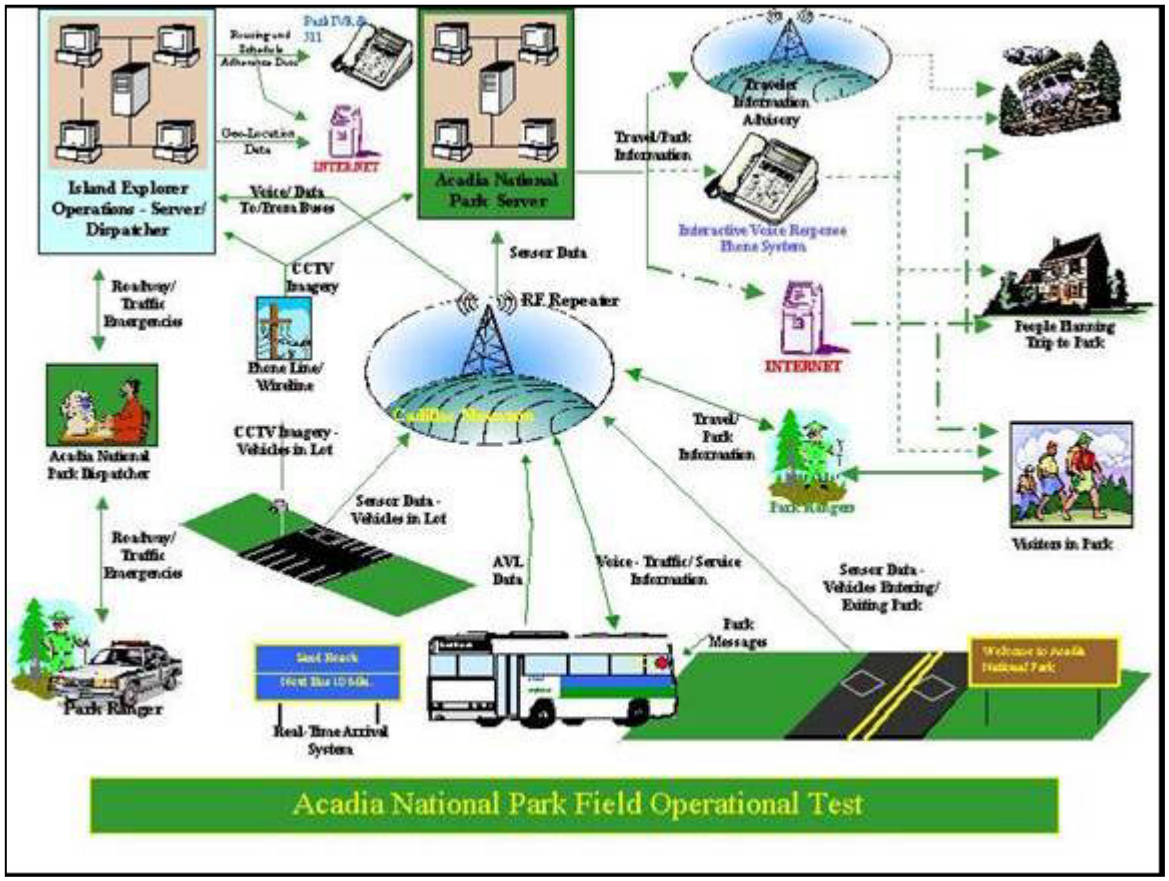


Figure 1-1: System Architecture for ITS FOT at Acadia National Park

Table 1.1: ITS System Components

System Component	Functional Requirements	System Elements	Needs Addressed
Island Explorer Two-way Voice Communications	Transmit and receive to/from/between vehicles and dispatch center	Transceivers; vehicle and base station Repeater to amplify signal	Improved efficiency Improved safety Real time traffic information for park staff, reduce crush load conditions, incident detection
AVL for Island Explorer	Compute and transmit vehicle location Integrate vehicle locations with departure signs, display vehicle locations[2], integrate into enunciator	Vehicle transmitter TCP/IP Network Connectivity, GPS Transceiver, GIS Applications, Travel Time Applications	Improved efficiency and performance Decreased use of POV's Improved safety and response Real time updates Increase ridership
Departure Sign for Island Explorer	Transmit location Compute departure Transmit to departure signs	Display sign, Software, Wireless/Wireline Communications	Improved scheduling information Increase ridership
Automated Annunciator for Island Explorer	Determine location Automatically play next stop and other pertinent announcements	Vehicle annunciator	Improve efficiency Reduce delays Increase safety Improve visitor experience
Passenger Counter for Island Explorer	Auto-count boardings/ dismounts at selected stops, Store information	Sensor to perform counts Data storage	Increase efficiency Improve planning Increase data options Reduce vehicle crush loads
Parking Lot Monitoring[3]	Record number of vehicles entering and exiting, provide slow scan video of parking area[4], transmit data, display video, store data from vehicle counts	Counting sensor Video camera Display monitor Wireless/wireline communications TCP/IP network connectivity	Decreased use of POV's Provide planning data Information for Rangers Decreased Response times
Automatic Ranger/Vehicle Geo-Location[5]	Determine location +-10 meters, transmit same to server, display locations on map	Transmitting unit GPS Transceiver Repeater for signal GPS/GIS Software	Information for Rangers Exact locations of Rangers Decreased response times Improved visitor safety, security
Entrance Traffic Volume Recorder[6]	Record and transmit number of vehicles entering and exiting, store data	Counting sensor Transmission unit	Count vehicles Provide Planning Data Decrease use of POV's
Traveler Information System	Collect and integrate data, disseminate data to appropriate audience	Interactive telephone messaging system[7], Web page, parking status signs	Increase availability and display options of information, Decrease use of POV's, Improve visitor experience

[2] Not operational during the Field Operational Test
[3] Observation was used as an alternative to automated parking monitors as a way to communicate parking lot status to visitors through the website and specially created parking status signs
[4] Eliminated from the Field Operational Test
[5] Eliminated from the Field Operational Test
[6] Not operational during the Field Operational Test
[7] Not operational during the Field Operational Test

2.0 GOAL AREAS ADDRESSED

As part of the planning for the ITS FOT, project stakeholders were asked what were important goal areas for evaluation of the effectiveness of this FOT. The goal areas identified were safety, mobility, efficiency, productivity and economic vitality, energy and environment, and customer satisfaction. In order to evaluate how effective this FOT was in addressing these goal areas, a further breakdown was accomplished to identify objectives, hypotheses supporting the objectives, identification of measures, and data collection methods.

The data collected from the Acadia National Park records support objectives and hypothesis in several goal areas. Table 2-1 below illustrates the goal areas that were identified by the stakeholders as relevant to data from the Park.

Table 2-1: Goal Areas, Objectives, and Hypothesis Relevant to Park Data

Evaluation Area	Objective	Hypotheses
Productivity and Economic Vitality	To maximize Acadia National Park revenue	ITS will provide better information that will ensure visitors will pay Park fees and make contributions
Efficiency	To increase the number of customers served	ITS provides better operating information, which allows for more efficient deployment of resources to a greater number of Park visitors
	To distribute the demand on Acadia National Park resources more evenly	Better information availability allows for visitor pre- and on-trip planning so that parking lots usage is more balanced
Safety	To increase transportation safety in Acadia National Park	ITS will reduce hazardous conditions by better management of transportation resources

3.0 DATA COLLECTED

In order to determine the impact of the ITS deployment in the three goal areas in Figure 2-1, Park data normally collected for operations and audit purposes were used. Data included the number of visitors, donations and gate receipts, and vehicular accidents within the Park. The data were collected for the years 1999 through 2002.

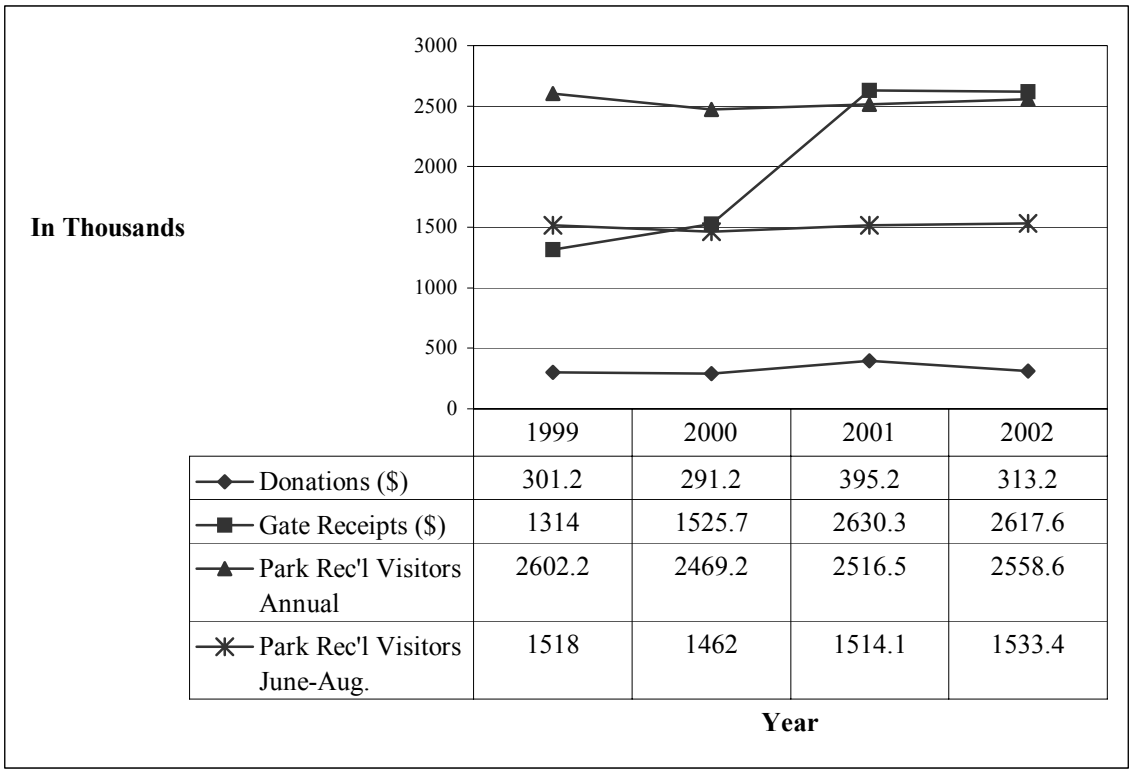
4.0 DISCUSSION OF RESULTS

The results are presented below according to the three evaluation goal areas for which the Acadia National Park statistics were used: productivity and economic vitality; efficiency; and safety.

4.1 Productivity and Economic Vitality

Stakeholders of the Field Operational Test anticipated that ITS might provide direct economic benefits to the Park in the form of higher receipts of gate fees and donations by visitors. While the official policy requires that visitors to the Park pay for a Park pass, in practice it is possible to enter the Park without a pass. Through the various means of providing traveler information that were part of the FOT, travelers could be informed of the Park pass requirement. Furthermore, by enhancing visitor experience ITS would lead to greater satisfaction on the part of visitors and increase the likelihood of visitor donations to the Park, either directly or through Friends of Acadia. To assess the impact of ITS, records were obtained from Acadia National Park from 1999 through 2002 and are shown in Figure 4-1.

As the Figure 4-1 indicates, both annual donations and gate receipts show an overall increase from 1999 to 2002. The increase in gate receipts is especially notable, as they doubled during that four-year period. Moreover, gate receipts increased from 2001 to 2002 when ITS was deployed. They also rose on a per visitor basis from $.94 to $1.03 during those two years.



	1999	2000	2001	2002
Donations ($)	301.2	291.2	395.2	313.2
Gate Receipts ($)	1314	1525.7	2630.3	2617.6
Park Rec'l Visitors Annual	2602.2	2469.2	2516.5	2558.6
Park Rec'l Visitors June-Aug.	1518	1462	1514.1	1533.4

Figure 4-1: Acadia National Park Donations and Gate Receipts (in 1000's) by Year

Donations did not follow that pattern, given the peak year of 2001 prior to ITS. Donations are collected from a variety of sources, but are mostly dependent on one or two large donors (principally Friends of Acadia) each year. In 2001 a large increase in donations from private individuals and from a single large donor were observed. By contrast, the proportion of a few large donors in 1999, 2000, and 2002 was reported to be approximately equal.

Focusing attention just on gate receipts, the question is whether ITS had anything to do with the increase. In the initial planning of the on-board announcements for the Island Explorer, a message was planned to inform bus riders about the need to purchase Park passes. However, that message was not implemented in the deployed system, and, thus, there appears to be no direct link between the ITS technologies and higher gate receipts.

4.2 Impact of ITS on Efficiency of Usage within the Park

It was hypothesized that ITS would lead to improved efficiency in Park operations. Park staff would be able to serve greater numbers of visitors and the demand on Park resources would be distributed more efficiently.

Figure 4-2 presents statistics on general usage. Counts of Park recreational visitors are estimates based on an occupancy factor applied to each vehicle entering the Park. The total recreational visitors increased steadily over the last three years. Although not reported in this document, data on usage of the Island Explorer bus system showed a dramatic increase in the proportion of those visitors carried by the bus during the summer months, especially from 2001 to 2002 when the ITS technologies were operational (15.6% in 2001 to 18.3% in 2002). From the standpoint of demand for the Park's transportation resources, it can be concluded that the Park is realizing greater efficiency by serving the same number of visitors with fewer in their own vehicles.

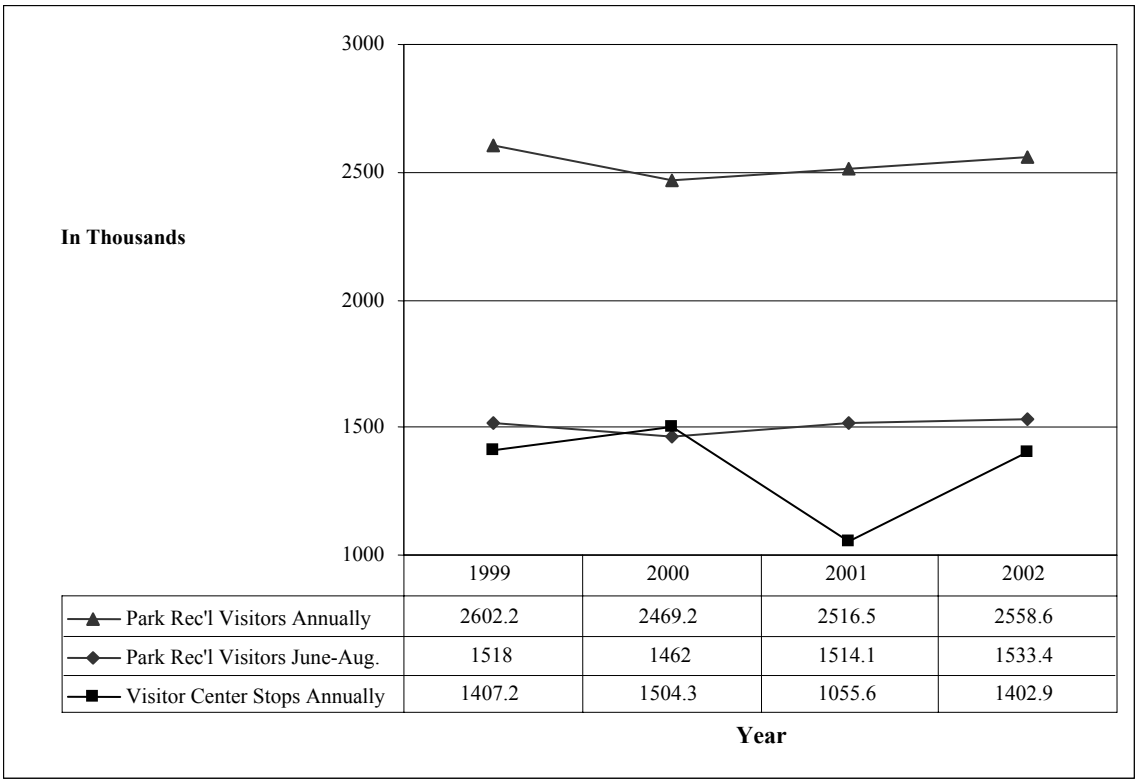


Figure 4-2: Statistics Related to Usage of Acadia National Park, 1999 - 2002

Figure 4-2 also shows the number of visitors who stopped at the Hull Visitor Center during their visit. These are annual figures, but typically over 85% of stops at the Visitor Center occur during the summer season. It was hoped that increased use of the Acadia National Park website and interactive telephone service equipped with bus and parking information would reduce the need for visitors to stop at the Visitor Center for information on parking and the Island Explorer bus. Although the Park's Website posted parking status information for the two most popular parking lots—Sand Beach and Jordan Pond House—no data are available on the number of visitors who accessed the site during the summer season. The interactive telephone system was not deployed during the 2002 tourist season, and therefore could not serve as an ITS component for testing. Moreover, the 2001 statistics on number of visitors to the Visitor Center show a marked decrease from the previous year prior to the ITS deployment, raising concern about the accuracy of the 2001 data. Thus, for a variety of reasons the impact of ITS on stops at the Visitor Center is indeterminate given the deployment situation and the available data.

4.3 Impact of ITS on Safety within the Park

Data on motor vehicle accidents within the Park were reported by Park rangers. Figure 4-3 shows the number of accidents along the roads within the Park that were used by the Island Explorer buses during the summer operating season. The definition of an accident is that it involves a motor vehicle with over $1000 in damage or involves any personal injury.

For vehicular accidents within the Park the data show a marked improvement in safety between 2001 and 2002—a 55% drop in accidents—the period that ITS suite of technologies was fully implemented.

Whether or not there is any causal relationship between ITS and the sharp drop in accidents cannot be determined. However, while the number of Park visitors increased by only 1.8% between 2001 and 2002, Island Explorer ridership increased by 17.1% as mentioned in section 4.2 of this report. Thus, to the extent that ITS enhances the appeal of the bus and having visitors tour the Park by bus rather than their own vehicles leads to fewer accidents, then ITS may indeed be behind the observed safety improvements.

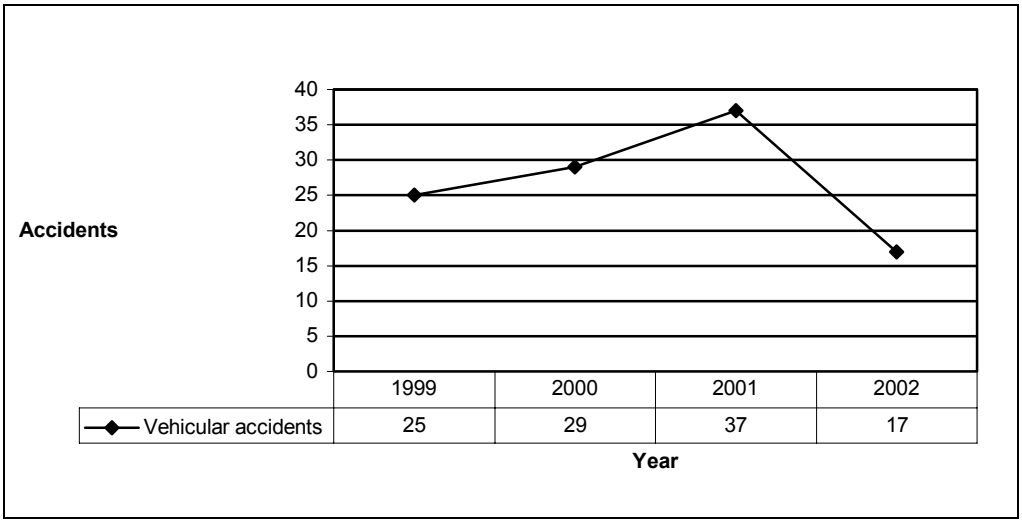


Figure 4-3: Vehicular Accidents within Acadia National Park, Summer Seasons 1999-2002

5.0 CONCLUSION

The analysis of operational data from Acadia National Park suggests that some but not all of the hypothesized impacts of ITS were realized. For the goal area of productivity and economic vitality, the pattern of funds received from gate receipts and donations were examined. Since a planned message to be placed on the Island Explorer's on-board annunciator that would have encouraged visitors to buy Park passes was not implemented in 2002, no ITS component could have had a direct impact on either gate receipts or donations. In the goal area of efficiency, the case can be made that the Park's road and parking resources were utilized more efficiently as a result of ITS. The rationale is that the same number of visitors is being served, but a greater proportion of their travel within the Park is on the Island Explorer. On the other hand, neither the deployment nor the available data suggested that fewer visitors were stopping at the Hull Visitor Center for information about parking and the Island Explorer. Finally, in the area of safety, the sharp decline of 55% in vehicular accidents within the Park from 2001 to 2002 suggests that ITS may have played a part attracting people to the Island Explorer rather than use their own vehicles.

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